

C. Huang et al.  
 U.S. Serial No. 10/763,656  
 Page 2 of 4

chip is mounted on and electrically connected to the substrate. Also, an encapsulation dam is formed on the continuous peripheral portion of the core. The encapsulation dam surrounds the chip, and the dam includes a shoulder portion adjacent to and flush with the solder mask layer.

Applicants' claimed invention is exemplified by the following copy of FIG. 1.

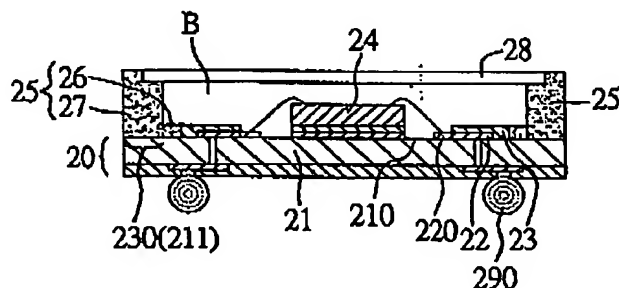


FIG. 1

As shown in FIG. 1, a solder mask layer 23 is applied over a surface 210 of the core 21. An encapsulation dam 25 is formed on a peripheral portion 211 of the core 21 and surrounding a photosensitive chip 24, where the dam 25 includes a shoulder portion 26 adjacent to and flush with the solder mask layer 23, and a protruded support portion 27 surrounding the shoulder portion 26 (see specification at page 6, first paragraph).

Applicants' claimed invention can yield significant benefits. Because the encapsulation dam is formed on the peripheral portion of the core (of the substrate), the dam is placed in direct contact with the core, which enhances adhesion between the dam and the substrate, which are both preferably made of resin materials, such that delamination between the dam and the substrate can be eliminated (see specification at page 10, last paragraph).

Claims 1, 3-5, 8, and 10-12 were rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,590,269 to Chuang et al. (hereinafter "Chuang") in view of U.S. Patent 6,635,209 to Huang. Claims 2, 6, 7, 9, 13, and 14 were rejected under 35 USC 103(a) as being unpatentable over Chuang in view of Huang, and further in view of U.S. Patent 6,448,665 to Nakazawa et al. These rejections are respectfully traversed.

C. Huang et al.  
U.S. Serial No. 10/763,656  
Page 3 of 4

The proposed combination of Chuang in view of Huang does not teach or suggest a semiconductor package with a photosensitive chip or a fabrication method thereof having an encapsulation dam including a shoulder portion adjacent to and flush with a solder mask layer.

The Chuang reference was described in the Background section of the application (see page 1, last paragraph to page 2, second paragraph; FIG. 4). In Chuang, a frame layer 32 is attached to a layer of solder mask applied over a substrate 30 in a manner well known in the art (see, e.g., FIG. 4 of Chuang, which is a simplified view omitting the solder mask layer, conductive traces, etc.). As explained in the Background section of the application, it is known to those skilled in the art that adhesion between a resin compound of an encapsulation body (i.e., the frame layer 32 in Chuang) and a solder mask is weak, and the contact area between the encapsulation body and the substrate (i.e., the substrate 30 in Chuang) is small, so delamination of the encapsulation body from the substrate and other problems may occur (see page 2, second paragraph of specification). Applicants' claimed invention specifically resolves these problems by forming an encapsulation dam having a shoulder portion adjacent to and flush with the solder mask layer, as recited in claims 1 and 8.

On page 3, first paragraph of the Office Action, it was acknowledged that Chuang does not disclose an encapsulation dam having a shoulder portion adjacent to and flush with the solder mask layer.

The Huang reference, commonly owned with the present application, was cited to remedy the above-noted deficiencies. However, Huang is directed to a ball grid array (BGA) semiconductor package, which has a completely different structure and function than the photosensitive chip enclosed in a cavity, as recited in the Applicants' claimed invention. For example, in the Huang reference, the encapsulation body 150 completely encapsulates the chip, whereas in the Applicants' invention, the photosensitive chip must be exposed to light in order to function properly.

C. Huang et al.  
U.S. Serial No. 10/763,656  
Page 4 of 4

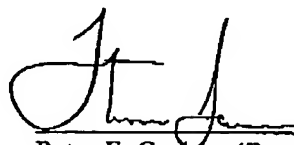
On page 3 of the Office Action, FIG. 5A of Huang was cited, where FIG. 5A shows a first step in an encapsulation process. However, the encapsulation body 150 depicted in FIG. 5C has a completely different structure and function than the Applicants' claimed semiconductor package. Moreover, the encapsulation body 150 in the Huang reference cannot be combined with Chuang, because the use of an encapsulation body that fully encapsulates the photosensitive chip 34 in Chuang would destroy the utility of the Chuang semiconductor package. As explained above, a photosensitive chip such as the chip 34 in Chuang must be exposed to light (i.e., through transparent layer 36 in Chuang), or else the semiconductor package will not function properly.

Therefore, it would not be possible to combine Huang with Chuang to somehow produce the Applicants' claimed invention. For at least the reasons discussed above, claims 1 and 8 are patentable over the proposed combination of Chuang in view of Huang. Also, dependent claims 3-5 and 10-12 are patentable over the cited references.

Regarding claims 2, 6, 7, 9, 13, and 14, the Nakazawa et al. reference fails to remedy the deficiencies of the proposed combination of Chuang in view of Huang. Applicants traverse this rejection for at least the reasons discussed above.

It is believed the application is in condition for immediate allowance, which action is earnestly solicited.

Respectfully submitted,



Peter F. Corliss (Reg. No. 33,860)  
Steven M. Jensen (Reg. No. 42,693)  
EDWARDS & ANGELL, LLP  
P.O. Box 55874  
Boston, MA 02205

Date: March 15, 2005

Phone: (617) 439-4444

Customer No. 21874